Amendments to the Claims:

This listing of claims will replace all prior versions, all listings, of claims in the application:

Listing of Claims:

Claim 1 (Currently Amended): A variable gain amplifier, comprising:

an amplifying stage for generating an output voltage according to a differential input voltage; and

a gain controlling stage for outputting a gain controlling voltage to determine a voltage gain of the amplifying stage according to a first controlling voltage and a second controlling voltage, such that the voltage gain is inversely proportional to a simple exponential function, the value of the simple exponential function being determined by the difference between the first controlling voltage and the second controlling voltage[[.]];

wherein the gain controlling stage comprises:

a transconductance unit for generating a first current and a second current according to the first controlling voltage and the second controlling voltage; and

an outputting unit for generating the gain controlling voltage according to the first current and the second current.

Claim 2 (Previously Presented): The variable gain amplifier of claim 1, wherein the denominator of the voltage gain of the amplifying stage is expressed as (K1+exp(K2 xVy)), both K1 and K2 are substantially constants, and Vy is the gain controlling voltage.

Claim 3 (Currently amended): The variable gain amplifier of claim [[2]] 1, wherein the gain controlling voltage is expressed in the form of the difference of the first and the second controlling voltages.

Claim 4 (Currently Amended): The variable gain amplifier of claim 1, wherein the gain controlling stage comprises:

[[a]] the transconductance unit for generating [[a]] the first current and [[a]] the second current according to the first controlling voltage and the second controlling voltage, wherein the ratio between the first current and the second current is determined by the difference between the first controlling voltage and the second controlling voltage;

a current transforming unit coupled to the transconductance unit for generating a third current corresponding to the first current, and a fourth current corresponding to the second current; and

[[an]] the outputting unit coupled to the current transforming unit for generating the gain controlling voltage according to the third current and the fourth current;

wherein the value of the gain controlling voltage is determined by the difference between the first controlling voltage and the second controlling voltage.

Claim 5 (Currently Amended): The variable gain amplifier of claim [[4]] 1, wherein the relationship between the first current, the second current, the first controlling voltage, and the second controlling voltage is: $I1 / I2 = \exp(K \times (V1-V2))$; where I1 is the first current, I2 is the second current, V1 is the first controlling voltage, and V2 is the second controlling voltage.

Claim 6 (Currently Amended): The variable gain amplifier of claim [[5]] 4, wherein the value of the third current is substantially the same as that of the first current, and the value of the fourth current is substantially the same as that of the second current.

Claim 7 (Currently Amended): The variable gain amplifier of claim [[5]] 1, wherein the gain controlling voltage is proportional to $\ln(I1/I2-K3)$ and I1, I2, and K3 [[is]] are respectively the first current, the second current, and a constant.

Claim 8 (Currently Amended): The variable gain amplifier of claim [[4]] 1, wherein the transconductance unit comprises:

a first transistor coupled to the first controlling voltage;

a second transistor coupled to the second controlling voltage; and

a first bias current source coupled to the first transistor and the second transistor for providing a first bias current;

wherein the first transistor outputs the first current according to the first controlling voltage and the first bias current, and the second transistor outputs the second current according to the second controlling voltage and the first bias current.

Claim 9 (Original): The variable gain amplifier of claim 4, wherein the outputting unit comprises:

a third transistor , wherein the current of the third transistor corresponds to the fourth current;

a fourth transistor; and

a second bias current source coupled to the third transistor and the fourth transistor for providing a second bias current, wherein the second bias current corresponds to the third current;

wherein the third transistor and the fourth transistor are for outputting the gain controlling voltage.

Claim 10 (Original): The variable gain amplifier of claim 9, wherein the value of the second bias current is substantially the same as the value of the third current, and the value of the current of the third transistor is substantially the same as the value of the fourth current.

Claim 11 (Currently Amended): The variable gain amplifier of claim [[4]] 1, ~~wherein the~~

~~current transforming unit comprises~~ further comprising a current mirror circuit.

Claim 12 (Original): The variable gain amplifier of claim 4, wherein the current transforming unit comprises:

a first current transforming unit, comprising:

a fifth transistor having a first end being coupled to a second end;

a sixth transistor;

a third bias current source coupled to a third end of the fifth transistor and the sixth transistor for providing a third bias current; and

a fourth current source coupled to the fifth transistor and the transconductance unit; and

a second current transforming unit comprising:

a seventh transistor having a first end and a second end being coupled to the sixth transistor for outputting the third current;

an eighth transistor coupled to the fifth transistor for outputting the fourth current; and

a fourth bias current source coupled to the seventh transistor and the eighth transistor for providing a fourth bias current.

Claim 13 (Currently Amended): A variable gain amplifier, comprising:

an amplifying stage for generating an output voltage according to an input voltage; and

a gain controlling stage for outputting a gain controlling voltage to determine a voltage gain of the amplifying stage according to a first controlling voltage V1 and a second controlling voltage V2, such that the voltage gain changes linearly in decibel in response to the ~~difference~~ subtraction between the first controlling voltage and the second controlling voltage[[.]];

wherein the gain controlling voltage is proportional to a logarithmic function, and

the voltage gain increases while the gain controlling voltage decreases;
wherein the variable gain amplifier further comprises a current mirror structure.

Claim 14 (Previously Presented): The variable gain amplifier of claim 13, wherein the voltage gain is inversely proportional to an equation expressed as k1x exp[k2(V1-V2)], in which both k1 and k2 are substantial constants.

Claim 15 (Previously Presented): The variable gain amplifier of claim 13, wherein the gain controlling stage comprises:

a transconductance unit for generating a first current and a second current according to the first controlling voltage and the second controlling voltage, wherein the ratio between the first current and the second current is determined by the difference between the first controlling voltage and the second controlling voltage;

a current transforming unit coupled to the transconductance unit for generating a third current corresponding to the first current, and a fourth current corresponding to the second current; and

an outputting unit coupled to the current transforming unit for generating the gain controlling voltage according to the third current and the fourth current;

wherein the value of the gain controlling voltage is determined by the difference between the first controlling voltage and the second controlling voltage.

Claim 16 (Previously Presented): The variable gain amplifier of claim 15, wherein the relationship between the first current, the second current, the first controlling voltage, and the second controlling voltage is: $I1 / I2 = \exp(Kx(V1-V2))$; where I1 is the first current, I2 is the second current, K is a substantial constant, V1 is the first controlling voltage, and V2 is the second controlling voltage.

Claim 17 (Currently Amended): The variable gain amplifier of claim [[16]] 15, wherein the value of the third current is substantially the same as that of the first current, and the value of the fourth current is substantially the same as that of the second current.

Claim 18 (Previously Presented): The variable gain amplifier of claim 16, wherein the gain controlling voltage is proportional to ln(I1/I2-K3) and K3 is a constant.

Claim 19 (Previously Presented): The variable gain amplifier of claim 15, wherein the transconductance unit comprises:

a first transistor coupled to the first controlling voltage;

a second transistor coupled to the second controlling voltage; and

a first bias current source coupled to the first transistor and the second transistor for providing a first bias current;

wherein the first transistor outputs the first current according to the first controlling voltage and the first bias current, and the second transistor outputs the second current according to the second controlling voltage and the first bias current.

Claim 20 (Previously Presented): The variable gain amplifier of claim 15, wherein the outputting unit comprises:

a third transistor , wherein the current of the third transistor corresponds to the fourth current;

a fourth transistor; and

a second bias current source coupled to the third transistor and the fourth transistor for providing a second bias current, wherein the second bias current corresponds to the third current;

wherein the third transistor and the fourth transistor are for outputting the gain controlling voltage.

Claim 21 (Previously Presented): The variable gain amplifier of claim 20, wherein the value of the second bias current is substantially the same as the value of the third current, and the value of the current of the third transistor is substantially the same as the value of the fourth current.

Claim 22 (Previously Presented): The variable gain amplifier of claim 15, wherein the current transforming unit comprises a current mirror circuit.

Claim 23 (Previously Presented): The variable gain amplifier of claim 15, wherein the current transforming unit comprises:

a first current transforming unit, comprising:

a fifth transistor having a first end being coupled to a second end;

a sixth transistor;

a third bias current source coupled to a third end of the fifth transistor and the sixth transistor for providing a third bias current; and

a fourth current source coupled to the fifth transistor and the transconductance unit; and

a second current transforming unit comprising:

a seventh transistor having a first end and a second end being coupled to the sixth transistor for outputting the third current;

an eighth transistor coupled to the fifth transistor for outputting the fourth current; and

a fourth bias current source coupled to the seventh transistor and the eighth transistor for providing a fourth bias current.

Claim 24 (New): The variable gain amplifier of claim 1, wherein the amplifying stage is coupled to the gain controlling stage by using a current mirror structure.

Claim 25 (New): The variable gain amplifier of claim 1, wherein the ratio between the first current and the second is determined by the difference between the first controlling voltage and the second controlling voltage

Claim 26 (New): The variable gain amplifier of claim 13, wherein the amplifying stage is coupled to the gain controlling stage by using the current mirror structure.